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# PATENT SPECIFICATION

Application Date: May 13, 1935. No. 14029/35.

456,746

Complete Specification Accepted: Nov. 13, 1936.



## COMPLETE SPECIFICATION

### Method and Means for Smoothing Mobile Films upon Webs

I, JAMES DONALD MACLAURIN, of 41, South Munn Avenue, East Orange, State of New Jersey, United States of America, a subject of the King of Great Britain, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

This invention relates to improvements in a process and apparatus for treating a fibrous web or other flexible web to smooth a liquid film or films previously applied to the surface of the web.

It has previously been proposed in Specification numbered 12141/1912 to employ streams of compressed air for effecting smoothing and equalizing of colour which has been applied to a web by coating devices, whilst the said colour is still damp. Nozzles were provided suitably disposed in proximity to the web coming from the colour applying apparatus and the compressed air was caused to impinge on the coloured surface.

According to the present invention I provide a process of treating a coated web for equalizing and smoothing the coating through the action of a pressure fluid directed against the web, characterized by the step of supplying the pressure fluid over the entire width of the web transversely of the direction of travel of the web and at right angles to the plane of the web, whereby a uniform pressure action extending over the entire width of the web is exerted.

Reference will now be made to the accompanying drawings in which:—

Fig. 1 is a diagrammatical side elevational view of an apparatus suitable for carrying out my invention.

Fig. 2 is a longitudinal, sectional view illustrating one of the "air knives" utilized in my invention.

Fig. 3 is a top plan view of the inner pipe of the air knife shown in Fig. 2.

Fig. 4 is a transverse sectional view taken on line 4—4 of Fig. 2.

Figs. 5, 6, 7, 8 and 9 are fragmentary top plan views of modified types of air knives.

Referring in detail to the drawings, 1

indicates a platform supported by up-rights or columns 2, a web 3 of paper or other flexible material which is adapted to be carried in a continuous manner over platform 1 as indicated by the arrow in Fig. 1.

The web 3 in its passage over platform 1 may be carried through a liquid applying device, shown diagrammatically at 4, said device being supplied with liquid from a supply vat 5. The device 4 is intended to indicate any type of mechanism for applying liquid to the surface of the web 3. In the event that web 3 comprises paper and it is desired to coat the same to render it suitable for the reception of print, the device 4 may comprise any of the conventional types of coating mechanisms, such as rolls, brushes, sprays or the like. In general, the function of the device 4 is to deposit on the surface of the web 3 a film or films of a liquid adapted to modify the surface of the web, the liquid being applied to the web in a mobile condition and covering the entire upper surface or a desired portion of the upper surface of the web.

The web 3, after leaving the liquid applying device 4, carries upon its upper surface a mobile film or films of liquid with which it is desired to modify the surface of the web. This film or films may be carried upon the surface in a more or less haphazard condition as to smoothness and distribution and, consequently, must be subsequently worked to produce a smooth, thoroughly applied coating. To accomplish this, a plurality of fluid discharging devices 6, hereinafter referred to as "air knives", may be positioned above the path of travel of the web, fluid under pressure being discharged from said air knives and being directed to the mobile liquid film or films upon the web surface. Fluid under pressure may be delivered to the air knives 6 through pipes 7 and 8, the passages of the fluid being controlled by valves 9 and 10, being respectively interposed in pipes 7 and 8. The opposite end of pipes 7 and 8 may be connected to a compressor 11 or other fluid supply means, said compressor being driven by motor 12.

provided in the lower portion of tube 18, which corresponds to tube 13. Tube 19, shown in Fig. 6, may be provided with a plurality of discontinuous slits 20. Tube 21 shown in Fig. 7 may be provided with a plurality of inclined slits 22, Fig. 8 shows a tube 23 provided with slits 24 inclined oppositely to slits 22, and Fig. 9 shows a tube 25 provided with a plurality of transversely disposed slits 26. Of course, many other forms of slits or openings may be used as found suitable to produce the results desired.

In the illustrated embodiment of my invention, two or more knives are described, but one or more may be used. In the event that more than one is used, the tubes comprising the knives may have the same or different type slits. For instance, if two knives are used, tubes 21 and 23 may be utilized in sequence to produce a characteristic effect, or tubes 19 and 25 may be used to produce a different effect. However, in the use of any type tube it is desirable that the pressure of the fluid discharged from the slits be uniform through the length of the knife. In using the various combinations of air knives herein suggested, a straight line air knife may be used in conjunction therewith, in which case the knives 21, 23, 19, 25 etc., may be used to "cut" up or mix the coating and the straight line knife may function to smooth the film.

The air knives hereinbefore described, that is, knife 6, and those comprising tubes 18, 19, 21, 23 and 25, are of the stationary type. However, if desired, said knives may be oscillated longitudinally by means (not shown) which is well known to the art.

In some cases, air under pressure may constitute the fluid discharged from the air knife in which case the physical action of the mass of air is of primary importance in acting upon the mobile film upon the web. The air, of course, also tends to accelerate drying or setting of the film. Of course, depending upon the character of the film, hot or cold air may be used whichever may be found to dry or set the film the quickest or best. If desired, the fluid discharged from the air knife may be impregnated with a vapour such, for example, as alcohol vapour, which may tend to keep the air knife clean, or any desired vapour may be used to improve the coating upon the web or accelerate drying. For instance, when a volatile fluid is incorporated in the coating material, alcohol, for example, the alcohol vapour discharged by the air knife is used as a "wetter" or spreader, especially when a relatively thin coating of liquid is applied, as much quicker

penetration of the coating fluid directly through the web is obtained when it is desired to have the colour penetrate to the opposite side of the web, or quicker spreading results on the surface when ordinary coating material is used and it is not desired to penetrate to the opposite side of the web. This may be used in making tinted papers directly on a paper making machine, either tinted on one or both sides.

If desired, the fluid applied by the air knife in addition to having a physical effect upon the film or films of modifying material, may be of such character as to react chemically with the modifying material to produce a desired result, in which case, the modifying material or materials carried to the surface of the web by the mechanism 4 would be of a sensitized character. In the event that paper is to be coated for printing purposes, a water mark may be formed upon the web by blocking off a portion of the web after application of the coating material by the mechanism 4, the blocking off of the water mark being done by stencil (not shown) or the like. When the blocked off portion of the web passes beneath the air knife or knives, the mark may be formed by the variation in distribution of the coating. This water mark may be affected by the pressure of the fluid upon the web as it passes under the air knife. Such fluid pressure from the air knife may be continuous or intermittent, as desired, or effected by a trigger mechanism, namely, shutting off and on the air in the air knife at any particular point so as to properly space the water mark or design.

The fluid is discharged from the air knife or fluid nozzles upon the preliminary coated web at right angles. It is advantageous and conducive to securing a well distributed, smooth and well compacted coating that the fluid be discharged in this manner. The wall or sheet of fluid striking the preliminary coating at right angles tends to force or drive the coating material or treating material into the pores of the web which firmly bonds the material to the web and prevents subsequent lifting of the coating therefrom.

It has heretofore been proposed to distribute air or other fluid into contact with a freshly coated web to smooth and distribute said coating or treating material upon the surface of the web. However, it has been the practice to discharge the fluid or air at an oblique angle to the surface of the web. Several undesirable features accompany the carrying out of a process wherein the air or fluid is discharged obliquely to the surface of the

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Fig. 1.

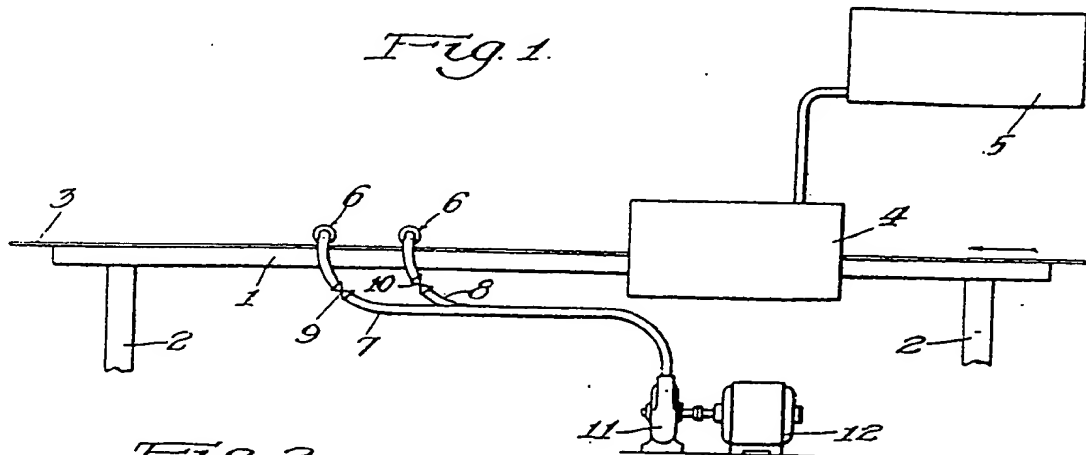


Fig. 2.

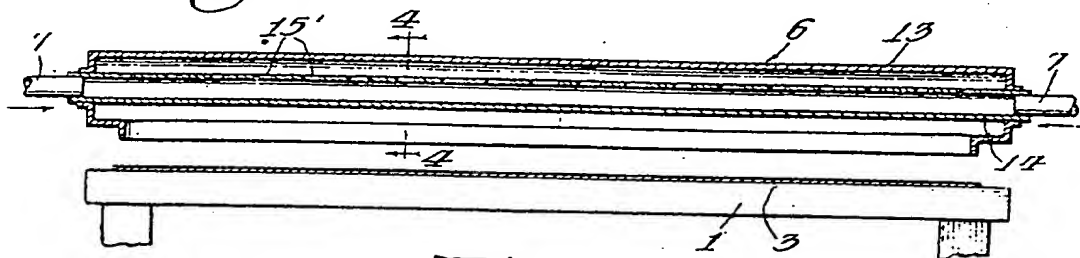


Fig. 3.

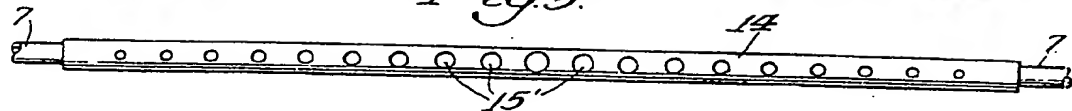
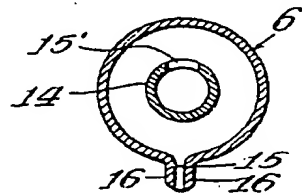


Fig. 4.



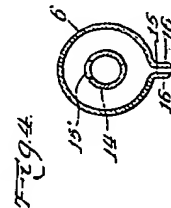
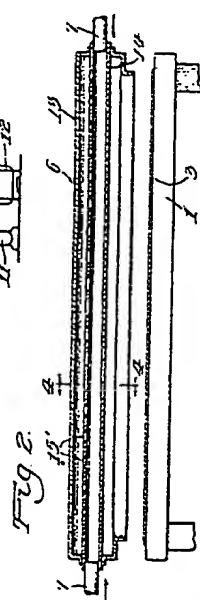
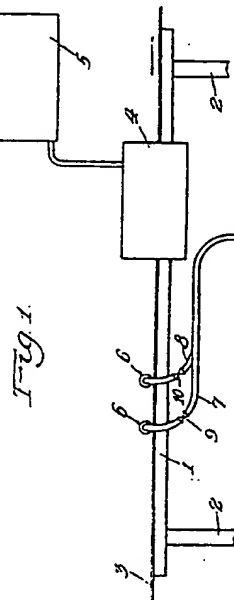


Fig. 5.



Fig. 6.



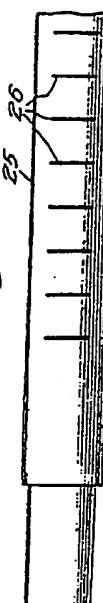
Fig. 7.



Fig. 8.



Fig. 9.



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